Course Overview

With the shift to value-based care, the healthcare industry is placing increasing emphasis on creating values for patients while improving performance baselines for care providers. Healthcare analytics and its application, therefore, play a critical role in allowing care providers to examine their internal processes and operations, and to propose new ways for them to create value both efficiently and effectively. Healthcare analytics is the branch of analysis that focuses on offering insights into hospital management based on data collected from four areas: claims and cost data, pharmaceutical and research and development (R&D) data, clinical data, and patient behavioral and sentimental data. The area of healthcare analytics is growing quickly and is expected to reach more than $18.7 billion by 2020.

This course reviews data sources, data processing, and data analytics models and tools with a focus on care provider performance in cost efficiency, revenue, process, clinical outcomes, patient safety, and patient experience. Upon completing the course, students should be able to perform business analysis in above areas. The new course will greatly improve the relevance of healthcare analytics curriculum and also allow students to have hand-on & guided practices of analytics with common data in healthcare industry.

Course Objectives

The objective of the course is to introduce data-driven, research-based models, skills and tools so that students can learn how to analyze and interpret data collected from multiple sources to assess performance baselines and to identify areas for improvements. Specific objectives include

- Understand challenges associated with value-based care reimbursement system
- Understand common data and structures that are available within healthcare settings
- Apply database management skills to extract, screen, and combine data from different sources
- Apply quantitative models and programming skills to visualize data, analyze data, and interpret results

Course Prerequisites


Course Relationship with Others in the Program

This course complements other courses in the MS-HSM program because it provides quantitative models and tools to improve operational and tactic issues in healthcare setting, such as cost efficiency, waiting time, health IT, process performance, patient experience, and resource planning.

Two Most Closely Related Courses and description of the differences from the proposed course:
22:799:580 Operations Analysis (3 credits)
This is the core MBA course that discusses general operations and supply chain management issues in manufacturing and distribution industries.

22:799:696 Healthcare Services Management (3 credits)
This course provides students with strategies, techniques, and best practices to improve unit, organizational, and integrated delivery system performance by applying key concepts from operations and supply chain management to the healthcare context. The Operations Analysis course complements this course by introducing quantitative models and tools to address operational and tactic issues that can be applied to healthcare delivery systems.

Learning Outcomes
- Understanding different performance metrics of a healthcare service provider under the value-based care model
- Understand the contexts associated with different primary and secondary data pertaining to care providers in healthcare settings
- Review basic commands in EXCEL
- Learn to extract, screen, and build databases through SQL
- Apply Tableau to visual data and to create dashboard
- Apply certain program (R, Python, SAS, or STATA, etc.) to address managerial questions by using regression models, logit models, cluster analysis, time series models.

Textbook
A Course-pack is required for the course, which includes required cases and reading materials. Instructions and ordering information will be announced in Week 1 of the semester.

Suggested e-Textbooks free download from Rutgers Library:


Software
In this course, we will use Microsoft Excel & ACCESS/SQL to prep data. In addition, we will need to use Tableau to visual data and additional program languages to conduct further statistical analyses. While no specific program languages is required, you should have basic programming skillsets with one of the following software packages R, Python, SAS, or STATA. Tableau licenses can be requested directly from the company and other statistics software licenses should be secured by students themselves.

Teaching Method
The course will be taught using PowerPoint presentations, case studies, and hands-on exercises. In each week, we will complete one lecture and all the associated readings, case studies, exercises and homework (see attached weekly schedule). Class-related material (lecture notes, videos, homework and solutions, etc.) will be posted on Blackboard. Students should be enrolled in Blackboard to access the posted materials. The URL is: [http://blackboard.rutgers.edu](http://blackboard.rutgers.edu).

Grading
A mid-term exam will cover the first half of the semester’s materials, and a final exam will cover the rest. In addition, there will be homework assignments and a term project with an in-class presentation (see term project). The weights for course work components are given below.
Class participation 10%
Mid-term 25%
Project & Presentation 20%
Homework Assignments 20%
Final 25%
TOTAL: 100%

Homework Assignments
Homework assignments should be submitted through blackboard. Be sure to put your name and contact information (email and optional telephone) on all homework submitted. Team work is expected for some assignments (to be specified in lectures), but team members must specify on the homework the percentage of work done by each of its members (for example, if everyone contributes equally in a 4-student team, then the percentage of work done by each student is 25%).

Assignments of a class are due by the next class, unless otherwise stated. Penalty for late submission (within one week) is 40% of the points allocated to the assignment. Submission will not be accepted if it is more than one week late.

Term Project
A term project on a healthcare services-related topic is a necessary part of the course. Each project should be a team effort of 4-5 people. Please select your team members in the first two weeks. Each project team will select a topic of interest (following the guidelines listed below), make a proposal (on the story, the problem, and your solution approach) and make a thorough presentation for about 10-15 minutes towards the end of the semester (see weekly schedule for dates). Every team member must present (detailed requirements for the project are noted below). Each team member must specify his/her percentage of contribution on the final submitted work. The project will be graded as a whole but each team member’s grade also depends on his/her contribution.

Each team serves on a consulting project by presenting a problem currently facing by care providers in healthcare industry, proposing specific business questions around the problem, and identifying potential causes of the problem, and suggesting potential solutions to solve the problem. The project needs to be business oriented, healthcare specific, and data driven. Each team can request different available datasets from the professor ranging from cost performance, patient satisfaction and experience, process of care, claim, health IT, etc. In order to stay relevant to the project, you can draw on your own work experience (that would likely be most interesting to the class) or study a case appeared in the literature or press. Avoid the very popular press or a shallow source. Rather, look for a serious professional article, such as a financial magazine (Wall Street Journal, New York Times, BusinessWeek), economics magazine, or a trade magazine (Sloan Management Review, Supply Chain Management Review, Inbound Logistics, etc.).

Sample relevant questions include:
- What are the profile of tech savvy hospitals? What are most popular health IT and how hospitals go along with implementation of health IT applications? What are the performance impact associated with health IT?
- What are the profile of patients seeking in-patient services? What is their experience with inpatient services and what might be potential areas for improvements?
- What processes are performed most frequently at hospital level? Is patient safety comprised in more or less frequently performed procedures?

In writing up the project report, express your personal opinion and conclusions on the chose problems based on solid data analytics results while stay connected with industry practices. Make sure your arguments are logical and backed by your research; you are encouraged, however, to voice opinions gleaned from your personal “crystal ball” (convictions and intuition), but be reasonable (and brief…). You
need to attach to your report supporting material, such as graphs, tables, charts, and statistical analysis results. Remember, anybody can collate material from the Web, but it is more difficult to analyze such material and reach conclusions. Analysis and conclusions will be the components of your term project most heavily weighted.

**Note:** You should *not* cut-and-paste verbatim material from Web pages or copy verbatim material from any other sources, unless you use that material as exact quotes. In that case be sure to enclose any pasted text material in double quotes and to provide an exact reference for it! All pasted graphs and charts should also be properly referenced. If you are unsure about referencing materials, please see the Academic Integrity information on Blackboard and/or the [Academic Integrity at Rutgers webpage](http://example.com).

III. Submission
The project is due in the second last week of the course (see weekly schedule). We will have in-class presentations so that teams can learn from each other. Prior to the presentation, each team should submit three (3) documents through Blackboard:

1. A PowerPoint file for the presentation
2. A Word document that includes background story, assumptions, the model, the solution, the interpretation and citations
3. An data file with all data and accompanying analysis including codes and outputs

A space will be created in the Assignment area of Blackboard where your project documents are to be submitted.
## Class Schedule (tentative)

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Topics covered</th>
<th>Assignments</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Introduction</strong>&lt;br&gt;Course policy, overview</td>
<td>• Readings, to be posted</td>
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<tr>
<td>2</td>
<td>Data analytics overview&lt;br&gt;General regression, time series, logistics regression, association rule, statistical reasoning</td>
<td>1/29/2020 - Last Day to <em>ADD</em> a class</td>
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<tr>
<td>3</td>
<td>Data management&lt;br&gt;SQL, programming (R/Python/SAS/SPSS/STATA), Tableau</td>
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<td>4</td>
<td>Data sources and governance&lt;br&gt;Clinical, cost, process, quality, and resources</td>
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<td>5</td>
<td>Data-driven problem solving&lt;br&gt;Managerial issues in healthcare under current value based care landscape</td>
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<tr>
<td>6</td>
<td>Analytics session I: cost/revenue &amp; claims&lt;br&gt;Operating expenses, revenue, service line (ICD &amp; MDC)</td>
<td>• HW 1 assigned</td>
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<td>7</td>
<td>Mid-term exam</td>
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<td>8</td>
<td>Analytics session II: quality&lt;br&gt;Mortality and readmission rates</td>
<td>• HW 1 due&lt;br&gt;• HW 2 assigned</td>
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<td>Spring Recess No Classes 3/14-3/22</td>
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<td>9</td>
<td>Analytics session III: patient experience&lt;br&gt;Patient experience with care delivery process</td>
<td>• HW 2 due&lt;br&gt;• HW 3 assigned</td>
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<td>10</td>
<td>Guest speakers</td>
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<td>11</td>
<td>Analytics session V: resource planning&lt;br&gt;LP modeling</td>
<td>• HW 3 due&lt;br&gt;• HW 4 assigned</td>
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<tr>
<td>12</td>
<td>Analytics session VI: patient safety&lt;br&gt;Patient safety outcomes and safety culture</td>
<td>• Project proposal due&lt;br&gt;• HW 4 due</td>
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<tr>
<td>13</td>
<td>Analytics session VII: story telling</td>
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<tr>
<td>13</td>
<td>Student Project Presentation / merge with Healthcare Services Management class (TBD)</td>
<td>• Project due</td>
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<td>14</td>
<td>Final exam</td>
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<td>Due by May. 16</td>
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